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Prevalence and Risk Factors of Bacterial Urinary Tract Infection among Adults with HIV/AIDS in a Tertiary Healthcare Facility at Awka

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ABSTRACT

Urinary tract infections (UTI) are one of the most prominent bacterial infections responsible for morbidity and hospitalization in HIV positive individuals. Therefore a hospital based cross-sectional study was conducted among 150 adult HIV/AIDS patients attending Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH) a tertiary health care facility in Awka, Southeast Nigeria to determine the prevalence and risk factors of Bacterial Urinary Tract infection among Adults with HIV/AIDS. Mid-stream clean catch urine samples were collected and examined using standard microbiological and biochemical procedures. A semi-structured questionnaire was used to obtain their Socio-demographic and clinical data. Data entry and analysis were done using statistical package for social science (SPSS), version 21 software and statistical significance was placed at P<0.05. Of the 150 examined urine samples, a total of 48(32%) showed significant bacterial growth. Six (6) bacterial species were isolated. They include *Escherichia coli* 16(33.3%), *Staphylococcus aureus* 16(33.3%), *Proteus mirabilis* 2(4.2%), *Klebsiella pneumoniae* 3(6.3%), *Enterococcus fecalis* 4(8.3%) and *Pseudomonas aeruginosa* 4(8.3%). The most predominant isolate was *S.aureus* 19(39.6%). Female participants had a higher prevalence of UTI 30(62.5%) compared to their male counterpart 18(37.5%). However, there was no statistically significant association between UTI and gender (P>0.05). Statistically significant association exist between place of residence (P=0.005411), marital status (P=0.0054), educational level (P=0.030914), current UTI symptoms (P= 0.00001), history of catheterization (P=0.00001) and Diabetes mellitus (P=0.00001) status with UTI. Thus, it is established that living in a rural setting, being married, lack of formal education, history of catheterization and Diabetes mellitus are risk factors for UTI. This is an indication that sensitization and screening for treatment of UTI in all HIV infected patient is very imperative and desirous.

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1. BACKGROUND

Urinary tract infection is defined as bacterial colonization and invasion of portions of the urinary system that are normally sterile (i.e kidneys, ureters, bladder and proximal urethra). It is detected by the presence of significant number of bacteria (greater than or equal to 10^5 CFU/ML) in the urine (Ranjal *et al*., 2017). Urinary tract infections (UTIs) affect all age group. It is an important cause of comorbidities in patients with underlying conditions and is largely responsible for hospital visit in all part of the globe (Odoki *et al*., 2019). It is the least investigated yet most prominent problem among HIV positive patients (Banu and Jyothi, 2013).

Under normal condition, human urine is sterile. It is usually free of microorganisms but made up of fluids, salts and waste products. An infection occurs when pathogen particularly bacteria from the gastrointestinal tract, attaches to the opening of the urethra and begin to multiply (Komala *et al*., 2013).

Bacteria, fungi and parasites can cause Urinary Tract Infection. Recent studies unveils a broad range of bacteria (mostly Gram negative organisms) – causing UTIs in HIV infected patients, including common uropathogens like *Escherichia coli, Proteus spp*, *Klebsiella spp* and nosocomial organisms such as *Pseudomonas aeruginosa, Streptococcus spp., Staphylococcus aureus* and unusual microorganisms including *Candida spp.* and *Salmonella spp* (Banu and Jyothi, 2013). Approximately 150 million individuals around the world are affected by urinary tract infection every year, costing more than 6 billion dollars in direct health care (Odoki *et al*., 2019). Morbidity and hospitalization caused by UTIs in infant boys, older men and females of all ages are significant.

A review of related research shows a urinary tract infections (UTI) prevalence rates ranging from 5.8% to 93.8% among HIV/AIDS patients as reported from different countries and geographical settings across the globe. Studies conducted in different parts of Nigeria recorded diverse prevalence rates of urinary tract infections in people living with HIV/AIDS. Some of the prevalence rates were high; these include a study in Rivers state conducted by Kemajou *et al.* (2016) having an overall prevalence rate of 57.3%, Prevalence in Aba among ART users was 40.39% (Kanu *et al.,* 2016). Another high Prevalence rate of 56.7% of urinary tract infections in HIV/AIDS patients under ART was reported in Edo State (Inyamba *et al*., 2016). On the contrary, a low prevalence of 5.8% was recorded from Jos metropolis, Nigeria (Sheyin *et al*., 2018). Studies on prevalence of UTI among HIV patients in Ethiopia were consistent across various regions. Findings showed prevalence of 10.7% in Gondar, Ethiopia, (Agersew *et al*., 2013), 10.3% in Haswassa Ethiopia (Tassema *et al*., 2020) and 12% in Jimma, Ethiopia (Debelke *et al*., 2014). Differences in sample sizes, ART use, immune status and environment may have played significant roles in the diversity of prevalence rates across various regions of the world. (Tassema *et al*., 2020)

Several factors are associated with urinary tract infections. Being female is a risk factor for UTI as a result of the short length of their urethra and the close proximity of the urethral orifice to the rectum, which is in direct contact with perianal microbes (Debalke *et al*., 2014). The anatomical relationship of the female urethra to the vagina exposes it to trauma during sexual activity as bacteria are pushed up the urethra into the bladder. In addition, the perineum of female gender is usually moist and this is a key factor that enhances the growth of gut micro flora and exposes females bladder to contamination (Mohammed, 2012). Other associated factors for UTI development in women include the Use of Diaphragm and spermicide, Antibiotic use, multiple sex partners, History of recurrent UTIs and contracting UTI at early age (Nelson and Good, 2015).

In males benign prostatic hyperplasia with obstruction, common in men over 50 years, prostate cancer, recent instrumentation or indwelling catheters, structural abnormalities, such as bladder diverticula neurologic conditions that interfere with normal voiding (eg, spinal cord injury) cognitive impairment and not being circumcised are potential UTI risk factors (Odoki *et al*., 2019)

Generally, poor hygiene practice especially in the perianal areas, suppression of the immune system as a result of diseases like Diabetes and HIV/AIDS enhances the development of UTI (Komala *et al*., 2013). Sexual practice of Homosexual men especially those who engage in anal sex without condom use put them at risk of UTI because fecal matter in the anus contain enteric bacteria that easily gain access to the urethra leading to infection (Mladenovic *et al.,* 2015).

People living with HIV have still have a compromised immune system and fewer T-cells despite the use of antiretroviral therapy (ART) to control the progression of the disease, thus the capability of the immune system to fight off infection is impaired, creating an enabling environment for growth and spread of pathogens that cause UTI (Onanuga and Selekere, 2018). Risk of a variety of opportunistic infection grows once a patient's CD4+ T-cell count falls below 200 cell/mm3. Urinary tract infections constitute approximately 60.0% of opportunistic infections associated with AIDS and this represents a significant health problem amongst people living with HIV (Kemajou *et al.*, 2016).

Studies from Tanzania (Chaula *et al.,* 2017) and Europe (Klasnic *et al.,* 2017) have shown that the prevalence and risk of urinary tract infection (UTI) among HIV infected patients may be significantly high in patients with CD4 cell counts < 200 cells/ μL. Evidences from observational studies confirms that the incidence of various bacterial infections such as UTI in HIV-infected patients is inversely correlated with lymphocyte CD4+ count (Banu and Jyothi, 2013).

2. MATERIALS AND METHOD

2.1. Study design

A hospital – based, cross – sectional study was employed in this research. The research determined the antibiotic susceptibility profile, risk factors and prevalence rates of urinary tract infections in adult HIV/AIDS patients that visited the COOUTH

Antiretroviral Therapy clinic between January 2022 and May, 2022.

2.2. Study setting

The study was conducted at Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH), a tertiary health care facility that provides services to people living with HIV in its functional Antiretroviral Therapy (ART) clinic. The health institution acts mainly as a referral center for other government-owned and private hospitals in the state. It is located in Awka the capital city of Anambra state, south-east Nigeria between 6.20°N and 6.28°N, and longitudes 7.00°E and 7.06°E. The study area covers 144.5 hectares with a 2006 population of 116,206 persons (NPC, 2009).

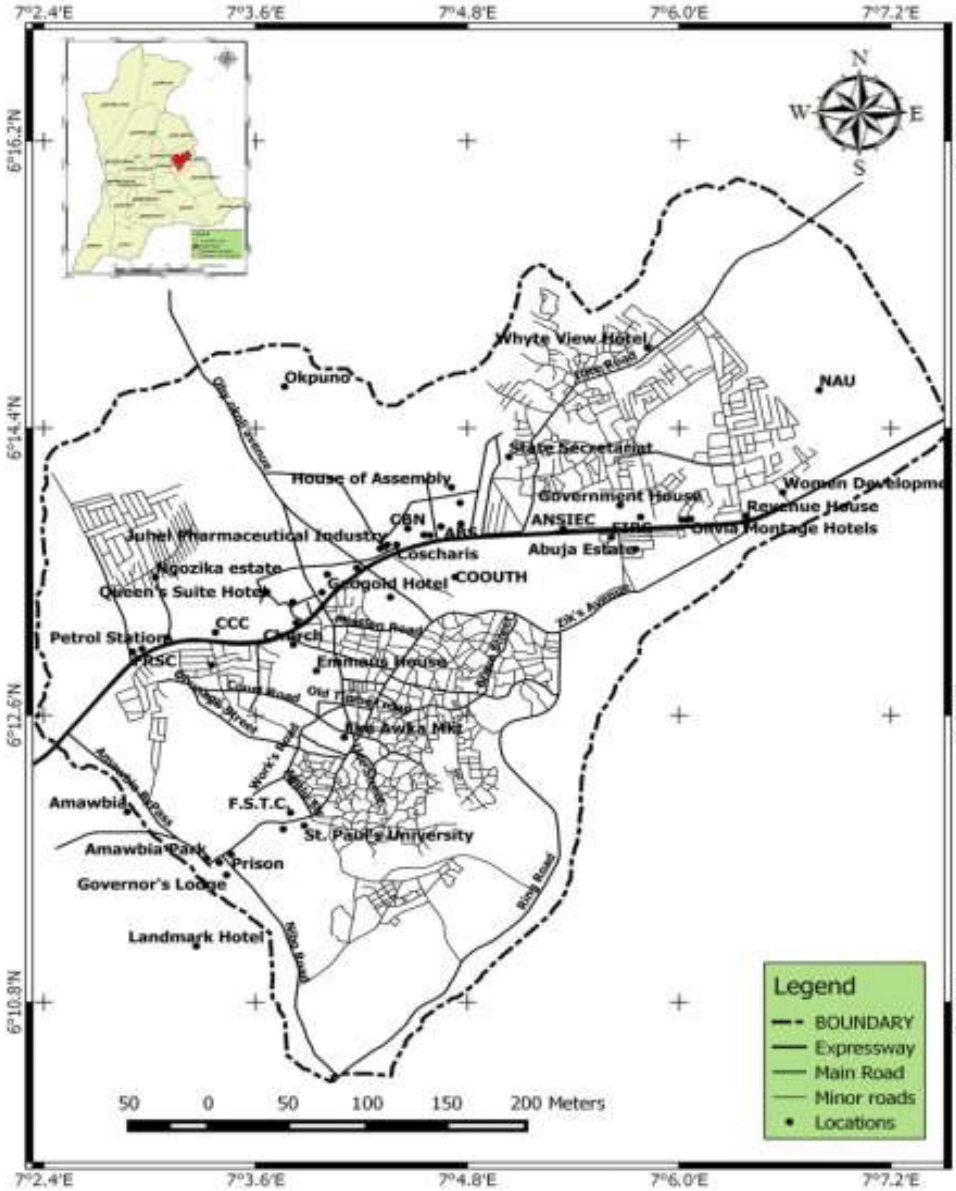

Figure 1: Map of Awka, showing the study site (COOUTH). Source: Aribodor *et al.,* (2017)

2.3. Study population

In this study all confirmed HIV positive adult patients who visit Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka for Antiretroviral Therapy including those on hospital admission within the period of study constituted the study population.

Inclusion criteria

1. All confirmed HIV positive patients who are adults (male and female inclusive) from the age of 18 years and above.
2. All HIV positive patients that visit the health-care facility to receive treatment and consented to the study.

Exclusion criteria

1. Children and adolescent victims of HIV below the age of 18 years.
2. HIV positive individuals who do not visit the health-care facility.
3. HIV negative individuals

2.4. Sample size determination

The minimum sample size required for the study was calculated using the Cochran's sample size formula for categorical data for studies of population size over 10,000. using the prevalence of 10.3% based on a similar study recently conducted by Tessema *et al* (2020) in Ethiopia.The sample size is determined as follows

$$n = \frac{z^2 \times p(1-p)}{e^2}$$

Where;
n= required sample size
Z= confidence interval level at 95% (1.96)
p= estimated prevalence (10.3% by Tessema *et al.,* 2020)
e= margin of error 5% (0.05)

$$n = \frac{1.96^2 \times 0.103(1-0.103)}{0.05^2}$$

$$= \frac{3.8416 \times 0.092391}{0.0025}$$

= 141.9717

The minimum sample size calculated was n=141.97. However, 150 samples were used for the study to improve the accuracy of the data. Thus, sample size of 150 adult HIV positive patients attending Chukwuemeka Odumegwu Ojukwu Teaching Hospital, Awka participated in this study.

2.5. Ethical consideration

An ethical approval to carry out sample collection for this study was obtained from the Teaching hospital's ethical health committees. Informed verbal consent was obtained from each participant prior to the administration of survey (questionnaire) for data collection, analysis and subsequent sample collections. Full assurance that all information collated throughout the study will be kept confidential was given. The results of all patients positive with urinary tract infections was to be duly disclosed to responsible health professionals in charge of the ART clinics of the health care facility.

2.6. Data collection

Standardized and validated semi- structured questionnaire was used to collect socio demographic data from the patients. The questionnaire was pre- tested on seven patients and errors noticed were corrected prior to the commencement of the study. These seven patients were not included in this study. The following information were captured in the questionnaire: age, gender, residence, level of education, history of catheterization, Diabetes mellitus status, marital status, employment status and previous history of urinary tract infections. Participants who are literate were supervised and told to fill the questionnaire themselves while the non-literate (who couldn't read or write) were assisted by a health personnel. Some responses to the questions were mutually exclusive while others required selection of more than one option.

2.7. Urine specimen collection for culture

A simple random sampling technique was used in this study to select 10 patients per week until sample size of 150 was reached. Urine samples were collected after adequate information and explanation was provided to the participants. Midstream clean catch specimen is the preferred type of specimen for culture and sensitivity testing because of the reduced incidence of cellular and microbial contamination. Participants were instructed to first cleanse the urethral area and then void the first portion of the urine stream into the toilet. These first steps significantly reduce the opportunities for contaminants to enter into the urine stream. The urine midstream was then collected into a clean container (any excess urine should be voided into the toilet). Urine samples collected were processed immediately in the microbiology laboratory.

2.8. Isolation and identification of uropathogens

A loop-full of 0.001 ml of thoroughly mixed, un–centrifuged urine specimen from each patient was inoculated Cysteine Lactose Electrolyte Deficient (CLED) agar and incubated for 24 hrs at 37˚C under aerobic conditions, and examined for characteristic color changes. After incubation, the cultures were subcultured on MacConkey agar and Blood Agar (BA) media, observed,and recorded. Significant bacteuria was established with bacterial growths $\geq 10^5$ cfu/ml. The number of bacteria (CFU) per milliliter or gram of sample was calculated by multiplying the number of colonies by the dilution factor. Identification of significant isolates was done based on colonial appearance, gram stain reactions and biochemical tests including catalase tests, coagulase test, indole test, oxidase test, urease tests and sugar fermentation tests

2.9. Statistical Analysis

Data entry and analysis were done using statistical package for social science (SPSS), version 21 software. The antibacterial activity was reported in terms of diameters of the zones of inhibition (mm) as resistant or sensitive. The chi-squared test ($\chi 2$) was used to determine the presence of statistically significant associations between the dependent variables and the independent variables. Chi square test made findings on comparison of positive UTI cases according to individual characteristics. A p-value of less than 0.05 was considered statistically significant, and null hypothesis was rejected. The lower the p-value, the stronger the relationship.

3. RESULTS

3.1. Morphological and biochemical identification of bacterial isolates

A total of one hundred and fifty (150) adult HIV positive patients attending Chukwuemeka Odumegwu Ojukwu Teaching Hospital (COOTH), Awka participated in the study with zero no response rate. Six different etiologic agents were isolated from the urine culture of adult HIV patients (Table 1). Of the 150 urine samples collected, 48 (32%) showed significant growth of uropathogenic bacteria (Figure 2).

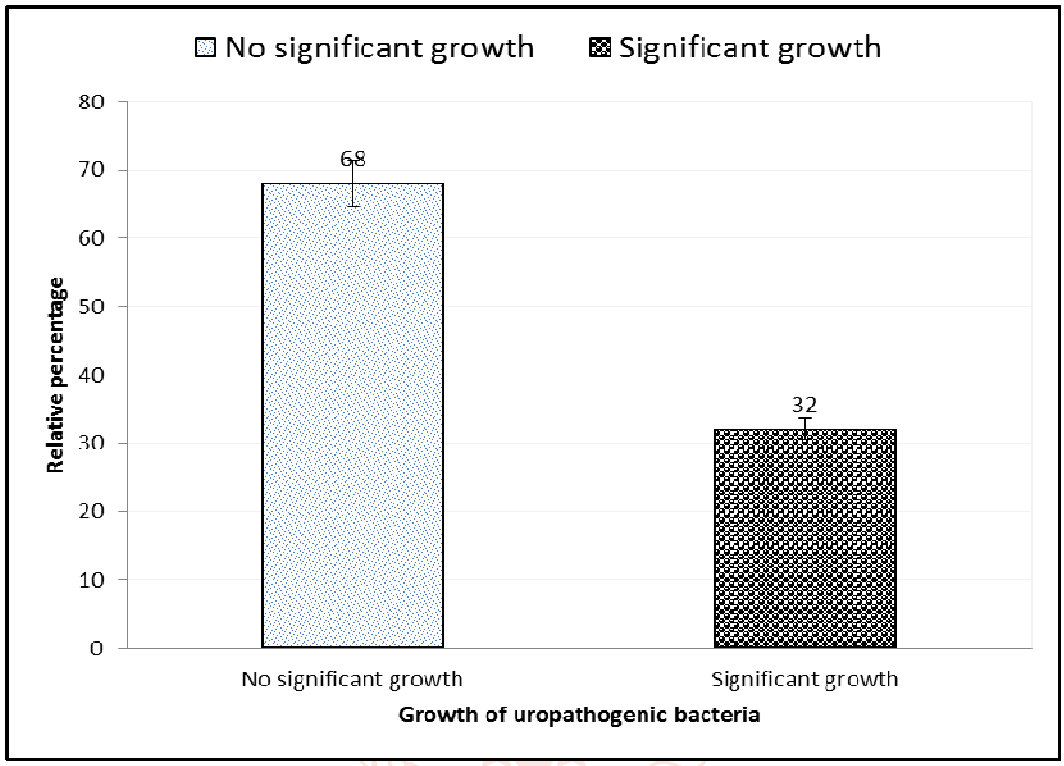

Figure 2: Growth of uropathogenic bacteria on urine sampled

3.2. Distribution of etiologic agents based on grams reaction

Majority of the etiologic agents were found to be Gram negative; and they include *Escherichia coli, Klebsiella pneumoneae, Proteus mirabilis and Pseudomonas aeruginosa*. The Gram positive isolates were *Staphylococcus aureus* and *Enterococcus fecalis*. Of the total positive cultures, Gram negative bacteria were predominant with 25(52.1%) while Gram positive bacteria were 23(47.9%) in the study. Four Gram negatives- *E. coli, K. pneumonia, P. mirabilis, P. aeruginosa* and two Gram positive- *S. aureus, E. faecalis* were isolated. The most predominant Gram negative isolate was *E. coli* 16(33.3%) while the most predominant Gram positive isolate was *S. aureus* 19(39.6%). In the overall distribution of isolated etiologic agent, the most prevalent uropathogenic bacteria based on this study is *Staphylococcus aureus* 19(39.6%), followed by *Escherichia coli* 16(33.3%), *Pseudomonas aeruginosa* 4(8.3%), *Enterococcus faecalis* 4(8.3%), *Klebsiella pneumonia* 3(6.3%). The least prevalent is *Proteus mirabilis* 2(4.2%) (Table 1).

Table 1: Distribution of etiologic agents based on Grams reaction of bacterial isolates

Agents	Number of isolates	Relative percentages (%)
Gram Negative		
Escherichia coli	16	33.3
K. pneumoniae	3	6.3
P. mirabilis	2	4.2
P. aeruginosa	4	8.3
Total	**25**	**52.1**

Gram Positive		
S. aureus	19	39.6
E. faecalis	4	8.3
Total	**23**	**47.9**

3.3. Socio-demographic characteristics and distributions of participants

The demographic distributions of the study participants are shown in Table 2. Of the 150 patients enrolled in this study, majority 80 (53.33%) were females. Age group 31-45 62(41.33%) had the highest distribution of patients. All male patients 70(100%) in this study were circumcised. Most of the patients are married 76(50.57%), living in urban areas 81(54%). 81(54%) were employed Those with secondary school education were 52 (34.67%) which is the highest distribution. Forty (26.67%) of participants had history of catheterization. The study reveals 16(10.67%) of patient suffer from diabetes mellitus and 108(72%) of participants have been previously diagnosed with UTI.

Table 2: Socio-demographic characteristics of patients

Characteristics	Frequency (no.)	Frequency percentage (%)
Age (y)		
18 – 30	18	12.00
31 – 45	62	41.33
46 – 60	51	34.00
Above 60	19	12.67
GENDER		
Male	70	46.67
Female	80	53.33
CIRCUMCISED MALE		
Yes	70	100.00
No	0	0.00
MARITAL STATUS		
Single	44	29.33
Married	76	50.67
Widowed	30	20.00
RESIDENCE		
Rural	69	46.00
Urban	81	54.00
FORMAL EDUCATION		
None	28	18.66
Primary	40	26.67
Secondary	52	34.67
Tertiary	30	20.00
EMPLOYMENT STATUS		
Housewife	6	4.00
Student	10	6.67
Employed	81	54.00
Unemployed	53	35.33
HISTORY OF CATHETERIZATION		
Yes	40	26.67
No	110	73.34
DIABETES MELITUS STATUS		
Yes	16	10.67
No	134	89.33)
PREVIOUS DIAGNOSIS OF UTI		
Yes	108	72.00
No	42	28.00
Total	**150**	**100.00**

3.4. factors associated with prevalence of UTIs

Of 48 patients diagnosed with UTI, 18(25.7%) were male while 30(37.5%) were female; making females having a higher prevalence of UTI than males. However, there was no statistically significant association with UTI and patients gender (P=0.123), age of patient (P=0.255) and previous history of UTI diagnosis (P=0.179911). likewise there is no statistically significant relationship between UTI and employment status (P=0.06136). UTI was more prevalent among the married people in the study population with 36(47.4%) and the relationship with UTI statistically significant a (P=0.000066). Rural dwellers 30(43.5%) had higher prevalence compared to their urban counterpart 18(22.2%) and the relationship is significant (P=0.005411). likewise UTI positive patients without formal education had the highest prevalence of UTI 18(64.28%) and there is significant association between UTI prevalence and level of education (P=0.030914). this study further reveals there is an association between UTI and catheterization history (P=0.00001), current symptoms (P=0.00001) and Diabetes mellitus status (P=0.00001).

Table 3 Factors associated with UTI among PLHIV (N=150) attending ART Clinic, COOUTH, Awka

Socio-demographic characteristics	Number (%)	Urine culture		Chi-Square (X^2)	p-value
	Total	Positive N (%)	Negative N (%)		
Gender					
Male	70	18(25.7)	52(74.3)	2.3831	0.123
Female	80	30(37.5)	50(62.5)		
Age					
18-30	18	5(27.8)	13(72.2)	4.0622	0.255
31-45	62	15(24.2)	47(75.8)		
46-60	51	21(41.2)	30(58.8)		
Above 60	19	7(36.8)	12(63.2)		
Marital status					
Single	44	4(9.09)	40(90.9)	19.2537	0.000066
Married	76	36(47.4)	40(52.6)		
Widowed	30	8(26.7)	22(73.3)		
Residence					
Rural	69	30(43.5)	39(56.5)	7.7366	0.005411
Urban	81	18(22.2)	63(77.8)		
Educational level					
None	28	8(64.28)	10(35.7)	8.8811	0.030914
Primary	40	20(50)	20(50)		
Secondary	52	12(23.1)	40(76.9)		
Tertiary	30	8(26.7)	22(73.3)		
Employment status					
Housewives	6	4(66.7)	2(33.3)	7.3566	0.06136
Students	10	3(30)	7(70)		
Employed	81	30(37)	51(62.96)		
Unemployed	53	11(20.75)	42(79.25)		
Previous UTI history					
yes	108	38(35.2)	70(64.81)	1.7984	0.179911
No	42	10(23.8)	32(76.2)		
Current symptoms of UTI					
Symptomatic	92	42(45.7)	50(54.3)	20.3796	0.00001
Asymptomatic	58	6(10.3)	52(89.7)		
History of catheterization					
Yes	40	36(90)	4(10)	84.3249	0.00001
No	110	12(10.9)	98(89.1)		
diabetic mellitus status					
Diabetic	16	14(87.5)	2(12.5)	25.3532	0.00001
Non-diabetic	134	34(25.4)	100(74.6)		

4. DISCUSSION

The present study showed the prevalence and risk factors of bacterial Urinary isolates in adults with HIV/AIDS in Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka, Nigeria. Six different uropathogens –*Escherichia coli, Proteus mirabilis, Klebsiella pneumoniae, Pseudomonas aeruginosa, Staphylococcus aureus and Enterococcus fecalis* were isolated and identified. Majority are enteric bacteria that emanates from the gut and find their way into the urinary tract via the perianal area. This is consistent with the finding of Tassema *et al.,* (2020) and Skrzat-Klapaczyńska *et al.,* (2018)

The prevalence of UTI in adult HIV positive patients based on this study is 32%. This finding is consistent with a study in Nigeria by Okechukwu and Thairu (2019) where a high prevalence of 32.5% was reported for UTI in HIV infected children and adolescents. The prevalence in this present study is at variance with the finding of a study of UTI in HIV patient by Nwafia *et al.* (2021) conducted at University of Nigeria Teaching Hospital, Ituku-Ozala, Enugu where a very low prevalence of 5.7% was observed. Another study by Sheyin *et al.* (2018) where an attempt to determine the prevalence of UTI in HIV patients on Antiretroviral drugs in Jos metropolis shows a very low prevalence rate of 5.8%. Compared with this current study, a low prevalence rate of 8.06% was recorded in Iran (Raheem *et al*., 2013), 7.1% in Bangalore (Rashmi *et al*., 2013), 11.3% in Ethiopia (Fenta, 2016) and 12% was reported in a study at Jimma university, Ethiopia (Debalke, 2014). Prevalence studies with findings higher than this study includes findings by Inyamba *et al*. (2016) who reported a UTI prevalence of 56.7% in HIV seropositive individuals. In Aba, Nigeria a high prevalence of 40.39% was reported (Kanu *et al.,*2016). A study by Xavier *et al.,* (2015) recorded a very high prevalence of 77.5% in India. Another study in India by Banu and Jyothi (2013) recorded a high prevalence of 41.7%.

It is observed that the prevalence of UTI in HIV positive patients varies greatly as more reports from different studies in different locations were uncovered. Method of screening of participants, difference in study methods and design, study setting, hygiene standard, sexual activity and orientation, standard of living, prevalence of anatomic abnormalities, host behavioral factors, social habits, diseases like diabetes mellitus, immune status of participants and variation in sample sizes are prominent factors that could be responsible for this differences (Tessema *et al*., 2020).

In this current study, most of the uropathogens isolated from HIV patients were Gram negative bacteria (52.1%). This agrees with a study in Ethiopia (Hantalo *et al.,* 2020). A study by Tassema *et al.* (2020) also found a higher prevalence (91.2%) of Gram negative bacteria. Reason for the prevalence of Gram negative rods is due to the fact that most of them are normal flora in the gut and easily contaminate the urinary tract especially after defecation (Perpetua *et al.,* 2016). A contradiction to this finding is a study by Ngowi *et al.* (2021) in which the most common isolates in HIV positive patients were Gram positive bacteria. Four Gram negative isolates in this present study were *Escherichia coli, Proteus mirabilis, Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. *Escherichia coli* resides in the lower intestine and therefore should be found in excrement (Odoki *et al*.,2019). As opportunistic bacteria, *E. coli* can easily ascend upward from the anus in the direction of the vagina to cause UTI (Iregbu and Nwajiobi-princewill, 2013).

In this present study, 16(33.3%) *E. coli* isolates were gotten from 150 HIV positive patients. The prevalence of the *E. coli* isolates in this present study is low compared to the study by Tassema *et al.* (2020) where the prevalence was 69.6%. This study reveals *Staphylococcus aureus* had the highest prevalence 19(39.6%) compared to other uropathogenic isolates in HIV positive patients. A similar study in Ebonyi state, Nigeria by Ifeanyi (2013) to determine the frequency and antibiogram of uropathogens isolated from urine samples of HIV infected patients confirm *S. aureus* (45.33%) as the most prevalent UTI isolate. In Cape coast, Ghana Barnie *et al*., (2019) also observed that *S. aureus* (40%) was the most predominant isolate in urine specimen of Antiretroviral therapy users. Findings from a study of UTI among Diabetic patients in Bushenyi district, Uganda revealed *S. aureus* (43.7%) as the most prevalent bacterial uropathogen isolated (Odoki *et al*.,2019). In addition, a study by Pam *et al* (2015) in Zaria, Nigeria reported reported *S. aureus* (50%) as the dominant bacteria followed by *E.coli* (18.8%).

The prevalence of *S. aureus* in this study disagrees with a study in Hawassa Ethiopia (Tessema *et al*.,2020) in which *E.coli* was the most predominant bacterial isolate (69.6%). A similar *E.coli* predominance was reported in Bushenyi district Uganda (41.9%) by Odoki *et al.* (2019). in Jimma, Ethiopia a study by Debalke *et al.* (2014) also reported a predominance of *E.coli* (54.3%). *Staphylococcus aureus* colonization has been discovered to be a risk factor for subsequent nosocomial infection in immunosuppressed individuals like HIV positive patients (Ifeanyi, 2013).

HIV positive individuals are vulnerable to opportunistic and common bacterial infections like *S. aureus* (Kemajou *et al*.,2016).

An important finding from this study reveals that female HIV positive patients have a higher prevalence of UTI compared to their male counterpart. Most bacterial isolates 30(62.5%) were found in female patients. Although the difference did not reach a statistically significant level (P=0.123). A similar study conducted in Tanzania agrees with this finding (Ngowi *et al*.,2021). Female preponderance to UTI among HIV patients is in tandem with a finding in Aba, Nigeria where a high prevalence rate of 52.17% was reported in female patients whereas male patients recorded a prevalence rate of 17.14% (Kanu *et al.,* 2016). Sheyin *et al.* (2018) reported a higher prevalence of UTI in female 6.6% compared to males 4.8%. Females in Hawassa Ethiopia had five times more prevalence of UTI than male HIV positive individuals (Tessema *et al.,* 2020). Also a study in Addis Ababa confirm female having three times more prevalence of UTI than males among HIV positive patients (Getu *et al.,* 2017). Similar findings in agreement with this study were reported in Northern Tanzania (Ngowi *et al*., 2021), India (Banu and Jyothi, 2013) and Uganda (Odoki *et al*.,2019). A contrary finding was reported in Calabar, Nigeria where males have a higher UTI prevalence of 28.6% whereas female have a lower rate of 23.8% (Inyang-etoh and Chibuzor*,* 2015).

Preponderance of females to UTI is due to a shorter and wider urethra, absence of prostatic fluid which is bacteriocidal, and possession of a moist urethra (Iregbu and Nwajiobi-princewil, 2013). Other factors that increases risk of UTI among female include mechanical introduction of pathogens during sexual activity, proximity of the female urethra to the anus, poor hygiene, poor toilet habit and trauma (Debalke *et al*., 2014). On the other hand, there is decreased incidence of UTI in males due to presence of prostactic fluid and its bacteriostatic property which limit invasion of the male urinary tract by uropathogens in addition to wide practice of circumcision among males in the study setting (Kanu *et al.,* 2016). All the 70 male HIV positive patients in this study were circumcised. This cultural practice in males subjects limits the colonization of the urethral opening with uropathogens thus, reducing the risk of UTI (Okechukwu and Thairu, 2019).

This study also reveal there is statistically no significant association between UTI and age of participants (P=0.255) and between UTI and employment status (P=0.06136) among HIV patients. A similar study in Jos, Nigeria agrees with this finding (Sheyin *et al.,* 2018). Association between UTI and Previous UTI history was not statistically significant (P=0.179911). This is agrees with a study conducted among HIV positive patients in Jimma Ethiopia (Debalke *et al*., 2014) but contradicted a study in Hawassa, Ethiopia (Tassema *et al*., 2020) and Gondar Ethiopia (Agersew *et al.,* 2013).

Finding from this current study shows UTI is associated with being married. Among the HIV positive patients under study, the married ones had a higher number of bacterial isolates 36(47.4%) thus a higher tendency of being infected with UTI. This is in tandem with a finding by Nicolle (2008) from Canada who associated high prevalence among the married with the term "honeymoon" cystitis which is defined as the phenomenon of frequent UTI during Marriage. A study in Uganda (Odoki *et al*., 2019) also corroborate with the finding that that UTI is associated with being married. Although this contradicts the findings by Tassema *et al* (2020) in Jimma Ethiopia. Another contradictory finding in Jos Nigeria, reveals there is no statistically significant association (P>0.05) between UTI and marital relationship among HIV positive individuals (Sheyin *et al*., 2018).

Place of residence have a significant association with UTI prevalence. HIV positive patients who live in rural communities have a higher prevalence of bacterial isolates 30(43.5%) compared to HIV positive patients in urban areas. Thus, they have twice as much chance of having UTI. This finding is consistent with the result of a study conducted in Ambo town Ethiopia where it was observed there is statistically significant relationship between UTI and place of residence (Gessese *et al*., 2017). This might be due to poor living condition and low hygienic practice in many rural communities. On the contrary, findings by Odoki *et al.* (2019) reveals there is no statistically significant relationship between UTI and place of residence. Another study in Hawassa Ethiopia, reveals there is no significant relationship (P>0.05) between UTI and place of residence (Tessema *et al*., 2020).

This current study reveals association between UTI and level of literacy is statistically significant. Patients who are HIV positive without any formal education had the highest uropathogenic bacterial isolates 8(64.28%). Thus they have higher chance of having UTI than patients with secondary and tertiary education. This is could be due to poor observance of hygiene by many participants without formal education owing to their ignorance of the health implication of poor sanitary condition. Low prevalence of UTI among HIV patients with Tertiary

education (26.7%) shows that risk of having UTI is minimized by education due to awareness. On the contrary, a study conducted in Hawassa Ethiopia shows there is no statistically significant relationship (P>0.05) between UTI and level of literacy among HIV positive patients (Tessema *et al.,* 2020).

Report from this present study reveals there is a statistically significant relationship between UTI and current symptoms (P=0.00001). HIV positive Patients with current symptoms such as frequent urination, lower abdominal pain, painful urination, urine incontinence, vaginal itching and discharge had a higher prevalence of UTI compared to those without symptoms. This is consistent with the findings of a research conducted in Wolaita Sodo University referral teaching hospital, South Ethiopia in which it was revealed there is a significant relationship (P<0.05) between UTI and current symptoms (Hantalo *et al*., 2020). A similar study in Addis Ababa reveals that symptom such as dysuria has a statistically significant association with UTI (Yemisrach *et al*., 2017).

History of catheterization is strongly associated with UTI in HIV patients. This finding agrees with the discovery by Odoki *et al.* (2019) in which the association between UTI and history of catheterization was statistically significant. Another finding based on a study in South Ethiopia reveals there is a significant relationship (P<0.05) between UTI and catheterization history among patients infected with HIV (Hantalo *et al*., 2020).

Association between UTI and Diabetes mellitus status is significant. This is consistent with a study in Uganda in which there was statistically significant relationship between UTI and Diabetes mellitus (Odoki *et al.,* 2019). Possible reasons for the association between UTIs and diabetes may be altered immunity in diabetic patients which includes depressed polymorphonuclear leukocyte functions, altered leukocyte adherence, chemotaxsis, phagocytosis, impaired bactericidal activity of the antioxidant system and neuropathic complications, such as impaired bladder emptying (Perpetua *et al.,* 2016). Another critical factor is the presence of a higher concentration of glucose in the urine of diabetics which create a culture medium for uropathogens in diabetic patients that may result into UTIs (Odoki *et al*., 2019).

5. Conclusion

The findings of this study revealed that the important organisms responsible for UTI infection are enteric bacteria that colonize the perianal and vaginal regions. Bacterial Urinary Tract Infection was prevalent (32%) among adult HIV patients in this study with a female preponderance. Majority of the etiologic agents responsible for UTI in HIV patients were Gram negative enteric bacteria. The most predominant isolate is *Staphylococcus aureus* followed by *Escherichia coli*. There was significant association between place of residence, marital status, educational level, current UTI symptoms, history of catheterization and Diabetes mellitus status with the prevalence of UTI. Appropriate measures may help to reduce UTIs due to these associated factors. We recommend routine UTIs screening of patients with higher risk of developing UTI. If these routine checks are put in place, prevention of UTI can be realized at lower cost

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DISCLOSURE

All authors listed in this article declare that they have no conflicts of interest for this work

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